

What is claimed is:

1. A spark plug comprising:
  - a metal housing;
  - 5 a porcelain insulator installed in said metal housing;
  - a center electrode retained within said porcelain insulator, said center electrode having a length and a tip portion projecting from a tip of said porcelain insulator;
  - a shoulder formed on a side wall of said center electrode to
    - 10 define a large-diameter portion and a small-diameter portion of said center electrode, said shoulder tapering off to the tip portion of said center electrode and having a boundary leading to the large-diameter portion located inside said porcelain insulator;
    - a first ground electrode installed on said metal housing
      - 15 which has an end portion opposed to the tip portion of said center electrode to define a first spark gap therebetween;
      - a second ground electrode installed on said metal housing which has an end arranged outside the tip of said porcelain insulator and opposed over the tip of said porcelain insulator to a
        - 20 portion of the side wall of said center electrode to define a second spark gap in which sparks are to be generated to burn away carbon adhered to a surface of the tip of said porcelain insulator, resulting in a decrease in insulation resistance offered by said porcelain insulator; and
        - 25 a wear resisting member provided on said portion of the side wall of said center electrode for offering resistance to wear caused by

10073255 001302

the sparks generated in the second spark gap.

2. A spark plug as set forth in claim 1, wherein if an interval between an inner wall of said porcelain insulator and the side wall of said center electrode is defined as  $d$ , and a circle is defined which has a center on an inside corner of the tip of said porcelain insulator facing said center electrode and a radius  $R$  defined on a plane including a longitudinal center line of the spark plug, the interval  $d$  is the radius  $R$  plus 1mm, and said wear resisting member is located at least inside the circle.

3. A spark plug as set forth in claim 1, wherein said wear resisting member has a width which is opposed to said center electrode and greater than or equal to 0.5mm.

4. A spark plug as set forth in claim 3, wherein said wear resisting member is provided over an entire periphery of the side wall of said center electrode.

5. A spark plug as set forth in claim 1, wherein said wear resisting member has a surface substantially lying flush with a surface of the side wall of said center electrode.

6. A spark plug as set forth in claim 1, wherein said wear resisting member is made of a metallic material which is higher in melting point than an Ni alloy.

7. A spark plug as set forth in claim 6, wherein said metallic material is one of a Pt alloy and an Ir alloy.

5 8. A method of producing a spark plug including: (a) a metal housing; (b) a porcelain insulator installed in said metal housing; (c) a center electrode which is retained within the porcelain insulator and has a tip portion projecting from a tip of said porcelain insulator; (d) a first ground electrode installed on the metal housing  
10 which has an end portion opposed to the tip portion of the center electrode; and (e) a second ground electrode installed on the metal housing which has an end arranged outside the tip of the porcelain insulator and opposed over the tip of the porcelain insulator to a portion of a side wall of the center electrode, the method comprising  
15 the steps of:

preparing a center electrode material for making the center electrode;

machining said center electrode material to form a large-diameter portion, a small-diameter portion closer than the  
20 large-diameter portion to a tip of said center electrode material, and a shoulder between the large-diameter and the small-diameter portions; and

welding a wear resisting member to the shoulder of said center electrode material:

25

9. A method as set forth in claim 8, further comprising the step

of machining said center electrode material and said wear resisting member welded to the shoulder of said center electrode material to establish a desired shape of the center electrode.

- 5 10. A method as set forth in claim 8, further comprising the step of welding a noble metal chip to a tip of the center electrode.

11. A method of producing a spark plug including: (a) a metal housing; (b) a porcelain insulator installed in said metal housing; (c)  
 10 a center electrode which is retained within the porcelain insulator and has a tip portion projecting from a tip of said porcelain insulator; (d) a first ground electrode installed on the metal housing which has an end portion opposed to the tip portion of the center electrode; and (e) a second ground electrode installed on the metal  
 15 housing which has an end arranged outside the tip of the porcelain insulator and opposed over the tip of the porcelain insulator to a portion of a side wall of the center electrode, the method comprising the steps of:

- preparing a ring-shaped wear resisting member working to  
 20 provide resistance to spark-caused wear;

preparing a center electrode material for making the center electrode;

- machining said center electrode material to form a  
 large-diameter portion, a small-diameter portion closer than the  
 25 large-diameter portion to a tip of said center electrode material, and a shoulder between the large-diameter and the small-diameter

100733668-021302

portions; and

welding said ring-shaped wear resisting member to the shoulder of said center electrode material:

- 5    12.    A method as set forth in claim 11, further comprising the step of machining said center electrode material and said ring-shaped wear resisting member welded to the shoulder of said center electrode material to establish a desired shape of the center electrode.

10

13.    A method as set forth in claim 11, further comprising the step of welding a noble metal chip to a tip of the center electrode.

10077966 041303  
20220320